

Docket No.AUS920010102US1

**METHOD FOR PRESENTATION OF HTML IMAGE-MAP ELEMENTS IN NON  
VISUAL WEB BROWSERS**

5                   **CROSS REFERENCE TO RELATED APPLICATIONS**

10           The present application is related to co-pending  
U.S. Patent Application Serial No. \_\_\_\_\_ (IBM Docket  
No. AUS920010295US1) entitled "EDITING HTML DOM ELEMENTS  
IN WEB BROWSERS WITH NON-VISUAL CAPABILITIES" filed even  
date herewith. The content of the above mentioned  
commonly assigned, co-pending U. S. Patent applications  
are hereby incorporated herein by reference for all  
purposes.

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**BACKGROUND OF THE INVENTION**

**1. Technical Field:**

20           The present invention relates to computer network  
environments and more specifically to non-visual  
presentation of electronic documents.

**2. Description of Related Art:**

25           Information on the World Wide Web is typically made  
available by structuring the information into a visual  
presentation. Hyper Text Markup Language (HTML) is used  
by web authors to define the visual structure. The end  
user is presented with this information by viewing the  
30   information on a computer display, after the information  
has been rendered into a visual format by a web browser  
(e.g. Netscape Navigator or MS Internet Explorer).

Web sites of well established businesses and

organizations make extensive use of visual images. A HTML MAP defines a set of sub-regions over the image area. Each region is called an AREA, and is defined by an AREA element within the MAP definition. Each AREA can  
5 be associated with an Internet Uniform Resource Locator (URL). When the end user performs a mouse click within an area defined by the MAP, the web browser will navigate the associated URL. This process works well for a sighted user who is accessing the web using a visual  
10 browser. However, this process is not accessible by people with vision impairments, nor is it accessible by users who do not have a visual display device available (e.g. while driving a car).

A variety of software products are becoming  
15 available which enable non-visual access to HTML pages. These products capture the web page content and then present an audible rendering of the web page. This is generally accomplished by using a text-to-speech (TTS) technology to read the textual content.

20 However, images with MAP-AREAs cannot be directly rendered by non-visual browsers and TTS technology, because there is no text. For example, the words that one is able to read in the navigation bar of a web page are actually pictures of printed text, and consequently,  
25 cannot be read by a screen reader. The screen reader only knows that there is an image, but does not know whether the image is a picture of the beach or a vase of flowers.

Prior art approaches to the problem involve either  
30 ignoring the image or simply announcing the fact that there is an image that contains MAP-AREAs. However, unless the web authors have provided "alt" text for non-image rendering, the hyperlinks cannot be accurately

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described. For example, IBM markets a non-visual browser called Home Page Reader V2.5. In this product, the MAP-AREAs are rendered by reading a portion of the URLs associated with the areas. Unfortunately, most URLs are  
5 coded for computer rather than human consumption and do not give a description of an image that the user can understand.

Therefore, it would be desirable to have a method for accessing hyperlink information on web page images by  
10 means of a non-visual device.

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The present invention provides a method, program and apparatus for the rendering of an image in an electronic document by means of a non-visual browser. The invention comprises rendering an image area within a web page, wherein the image area is associated with a hypertext link to an image document which contains content for the image area. When the browser renders a requested web page containing the image area and/or receives a selection of the image area, it retrieves the header element of the image and non-visually renders the information contained within the header. This information might include a title and national language designation, as well as other information inserted into the header by the web author. Non-visual rendering may be audible or by means of tactile feedback. In addition, non-visual rendering methods may be used in conjunction with traditional visual rendering, depending on the needs of the user.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented;

**Figure 2** depicts a block diagram of a data processing system that may be implemented as a server in accordance with a preferred embodiment of the present invention;

**Figure 3** depicts a block diagram illustrating a data processing system in which the present invention may be implemented;

**Figure 4** depicts a block diagram of a browser program in accordance with a preferred embodiment of the present invention;

**Figure 5** depicts a pictorial diagram illustrating a navigation bar on a web page in accordance with the prior art; and

**Figure 6** depicts a flowchart illustrating prefetching in accordance with the present invention.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

5 With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be  
10 implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire,  
15 wireless communication links, or fiber optic cables.

In the depicted example, a server **104** is connected to network **102** along with storage unit **106**. In addition, clients **108**, **110**, and **112** also are connected to network **102**. These clients **108**, **110**, and **112** may be, for example,  
20 personal computers or network computers. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. Network data processing system **100** may include  
25 additional servers, clients, and other devices not shown.

In the depicted example, network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another.  
30 At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial,

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government, educational and other computer systems that route data and messages. Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as for example, an  
5 intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation for the present invention.

Referring to **Figure 2**, a block diagram of a data processing system that may be implemented as a server,  
10 such as server **104** in **Figure 1**, is depicted in accordance with a preferred embodiment of the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**.  
15 Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**. Memory  
20 controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**. A number of modems may be connected to PCI  
25 bus **216**. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in  
30 boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI buses **226** and **228**, from

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which additional modems or network adapters may be supported. In this manner, data processing system **200** allows connections to multiple network computers. A memory-mapped graphics adapter **230** and hard disk **232** may  
5 also be connected to I/O bus **212** as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk  
10 drives and the like, also may be used in addition to or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may  
15 be, for example, an IBM RISC/System 6000 system, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram  
20 illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the  
25 depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also  
30 may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component



interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

An operating system runs on processor **302** and is used to coordinate and provide control of various components within data processing system **300** in **Figure 3**. The operating system may be a commercially available operating system, such as Windows 2000, which is available from Microsoft Corporation. An object oriented programming system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system **300**. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are located on storage devices, such as hard disk drive **326**, and may be loaded into main memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral

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devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. Also, the processes of the present invention  
5 may be applied to a multiprocessor data processing system.

As another example, data processing system **300** may be a stand-alone system configured to be bootable without relying on some type of network communication interface,  
10 whether or not data processing system **300** comprises some type of network communication interface. As a further example, data processing system **300** may be a Personal Digital Assistant (PDA) device, which is configured with ROM and/or flash ROM in order to provide non-volatile  
15 memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations. For example, data processing system **300**  
20 also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system **300** also may be a kiosk or a Web appliance.

Turning next to **Figure 4**, a block diagram of a browser program is depicted in accordance with a  
25 preferred embodiment of the present invention. Browser **400** includes a user interface **402**, which is a graphical user interface (GUI) that allows the user to interface or communicate with browser **400**. This interface provides for selection of various functions through menus **404** and  
30 allows for navigation through the navigation input **410**. For example, menu **404** may allow a user to perform various functions, such as saving a file, opening a new window,

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displaying a history, and entering a URL. Navigation **410** allows for a user to navigate various pages and to select web sites for viewing. For example, navigation **410** may allow a user to see a previous page or a subsequent page relative to the present page. Navigation **410** may also have voice recognition capabilities. Preferences may be set through preferences **406**. Browser **400** also contains text-to-speech (TTS) **408**, which converts text data into auditory signals.

Communications **412** is the mechanism with which browser **400** receives documents and other resources from a network such as the Internet. Further, communications **412** is used to send or upload documents and resources onto a network. In the depicted example, communication **412** uses HTTP. However, other protocols are possible. Documents that are received by browser **400** are processed by language interpretation **414**, which includes an HTML unit **416**, and a parser **418** which is capable of generating a parse tree associated with an electronic document, as discussed below in reference to **Figure 6**. Language interpretation **414** will process a document for presentation on graphical display **420**. In particular, HTML statements are processed by HTML unit **416** for presentation.

Graphical display **420** includes layout unit **422**, rendering unit **424**, and window management **426**. These units are involved in presenting web pages to a user based on results from language interpretation **414**.

Browser **400** is presented as an example of a browser program in which the present invention may be embodied. Browser **400** is not meant to imply architectural

limitations to the present invention. Presently available browsers may include additional functions not shown or may omit functions shown in browser **400**. As used herein, the term "browser" encompasses any software application used to view or navigate for information or data (e.g. something that assists a user to browse) in a distributed data base where the distributed database is typically the internet or World Wide Web.

Referring now to **Figure 5**, a pictorial diagram illustrating a navigation bar on a web page is depicted in accordance with the prior art. The navigation bar **500** contains several selections, including "How to Order" **501**, "Gift Ideas" **502**, and "International Orders" **505**. Navigation bar **500** is actually a single MAP-AREA which is divided into five non-overlapping subregions **501-505**. Each area **501-505** has an associated hypertext link to another web page. A mouse click over any of these areas **501-505** will take the user to the appropriate specialized catalog page.

This process works well for a sighted user who is accessing the web using a visual browser. However, this process is not accessible by people with vision impairments, nor is it accessible by users who do not have a visual display device available (e.g. while driving a car).

A variety of software products are becoming available which enable non-visual access to HTML pages. These products capture the web page content and then present an audible rendering of the web page. This is generally accomplished by using a text-to-speech (TTS) technology to read the textual content. However, images with MAP-AREAS cannot be directly rendered by non-visual

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browsers and TTS technology, because there is no text. Therefore, the contents of MAP-AREAs **501-505** in **Figure 5** cannot be rendered by prior art, non-visual browsers. In the prior art, MAP-AREAs are rendered by audibly reading a portion of the URLs referenced by the hypertext links associated with the MAP-AREAs. Unfortunately, most URLs are coded for computer rather than human consumption and do not give a description of an image that the user can understand. For example, the URL for the "How to Order" MAP-AREA **501** might be:

ref=gw tn ho rec/002-4815396-8524036

Accessing user friendly hypertext information on a web page image can be accomplished by prefetching the header information of the web pages that are referenced by MAP-AREA URLs. Then, instead of rendering the user unfriendly URL of the referenced page, the browser renders the more user friendly title (and possibly additional HEAD information).

Referring now to **Figure 6**, a flowchart illustrating prefetching is depicted in accordance with the present invention. As noted in reference to **Figure 5**, an image with a MAP-AREA can be associated with a hypertext link. Because non-visual browsers cannot directly render images, the present invention renders the content of an image indirectly by using the title of the web page referenced by an image.

The source text of an HTML page is divided into a HEAD section and a BODY section. When the browser receives a MAP-AREA selection from the user (step **601**),

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it prefetches only the HEAD element of the HTML page referenced by the selected MAP-AREA, rather than the entire HTML page (step **602**). The structure of HTML and HTTP protocols provides support for this approach,  
5 because facilities are provided for fetching only the information of interest.

The HEAD section contains the TITLE element, plus other information about the document, such as the national language in which the content is written (e.g.  
10 English, French German), as well as various user defined attributes, such as the web author's name. This HEAD content is typically only a few 10's or 100's of bytes, and may be fetched in as little as a single HTTP message.

The BODY section, in contrast, may be many 1000's of  
15 bytes, and may also require the download of other very large objects such as images. Many tens of messages, and hundreds of thousands of bytes, may be needed to download the entire page.

In order to describe the MAP-AREA, only the HEAD  
20 element of the HTML page needs to be fetched. HTTP already provides a feature to accomplish this task, in the current definition of the protocol (reference Internet Engineering Task Force (at <http://www.ietf.org>) document RFC 2616).

25 The browser can use the TITLE element within the HEAD to provide a non-visual rendering of the MAP-AREA content (step **603**). For example, the title of the web page that is referenced by the "How to Order" MAP-AREA **501** might be "How to Order FAQ". Instead of audibly

30 rendering this web page by speaking the URL (i.e. "ref gw\_tn\_ho\_rec/ 002-4814396-8524036"), the browser uses internet protocols to request the HEAD element of the web

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page referenced by the URL. Therefore, the browser will speak "How to Order FAQ" (the TITLE within the HEAD). In another embodiment, the browser can convey the information by means of a tactile feedback mechanism,  
5 rather than an audible one.

The present invention essentially creates a surrogate for image content by using the title of the web page referenced by that image.

Other information in the HEAD can also be used to  
10 provide additional information about the link in step  
**603**. For example, the national language of the link could be provided. Additional attributes could be defined for the HEAD element, which are specifically designated for Accessibility purposes. These additional  
15 attributes would be tailored for impaired users, and provide information specifically designed to compensate for particular impairments (e.g. audible description of an image).

The prefetch could also be overlapped with other  
20 user activity. For example, when a user first arrives at a new web page, the non-visual browser could start to speak the title of that page, and concurrently, prefetch the first few titles of any MAP-AREAS referenced by that page. At local area network (LAN) speeds, assuming a  
25 responsive server, a dozen MAP-AREA titles could be perfected in the time required to speak the title of the parent page.

It should be pointed out that the techniques for  
30 non-visual rendering are not necessarily exclusive of traditional visual rendering techniques. Both visual and non-visual technology may be used in conjunction with each other, depending on the needs of the user.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions in a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.